

## Active Reading

### Section: Energy and Chemical Reactions

Read the passage below. Then answer the questions that follow.

During a chemical reaction, a substance on which an enzyme acts is called a **substrate**. Enzymes act only on specific substrates. For example, the enzyme amylase assists in the breakdown of starch to glucose. In this reaction, starch is amylase's substrate.

An enzyme's shape determines its activity. Typically, an enzyme is a large protein with one or more deep folds on its surface. These folds form pockets called **active sites**. An enzyme's substrate fits into an active site.

**Step 1:** When an enzyme first attaches to a substrate during a chemical reaction, the enzyme's shape changes slightly so that the substrate fits more tightly in the enzyme's active site.

**Step 2:** At an active site, an enzyme and a substrate interact in a way that reduces the activation energy of the reaction, making the substrate more likely to react.

**Step 3:** The reaction is complete when products have formed. The enzyme is now free to catalyze further reactions.

#### SKILL: READING EFFECTIVELY

Read each question and write your answer in the space provided.

1. Define the two key terms contained in this passage.

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2. What substance is a substrate of amylase?

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3. What determines an enzyme's activity?

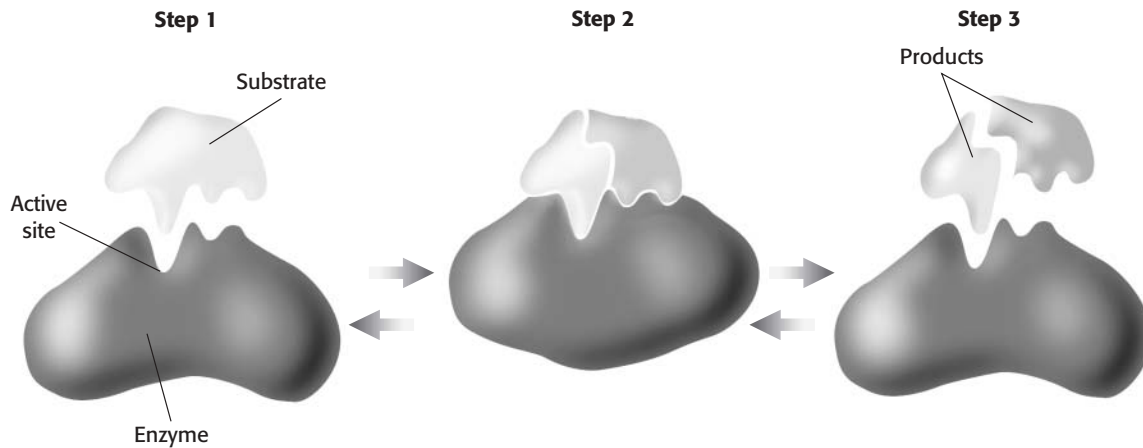
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**Active Reading** *continued*

**SKILL: INTERPRETING GRAPHICS**

**4.** The figure below shows how enzymes work. In the space provided, describe what is occurring at each step.



**a. Step 1:** \_\_\_\_\_

\_\_\_\_\_

**b. Step 2:** \_\_\_\_\_

\_\_\_\_\_

**c. Step 3:** \_\_\_\_\_

\_\_\_\_\_

**In the space provided, write the letter of the term or phrase that best answers the question.**

\_\_\_\_\_ **5.** What occurs when an enzyme and a substrate interact at an active site?

- a.** Activation energy is reduced.
- b.** The products are bound irreversibly.
- c.** The enzyme is changed by the reaction.
- d.** Activation energy is increased.

3. It is a key vocabulary word that is defined in this sentence
4. Covalent bonds that join atoms in molecules are similar to rivets and welds that join girders in a skyscraper.
5. b

### SECTION: WATER AND SOLUTIONS

1. acids and bases; they appear in bold-face type
2. Acids are compounds that form hydrogen ions when dissolved in water. Bases are compounds that reduce the concentration of hydrogen ions in a solution.
3. The concentration of hydrogen ions in the solution is increased above that of pure water.
4. a. form hydrogen ions when dissolved in water; have pH values below 7  
b. form hydroxide ions when dissolved in water; have pH values above 7  
c. water-soluble compounds
5. b

### SECTION: CHEMISTRY OF CELLS

1. carbon, hydrogen, and oxygen
2. two atoms of hydrogen to each atom of carbon and oxygen
3. fruits, vegetables, grains
4. monosaccharide; single (one) sugar
5.  $C_6H_{12}O_6$ ; 24 atoms
6. disaccharides; two joined monosaccharides
7. glucose and fructose
8. polysaccharides; three or more monosaccharides joined in a chain
9. d

### SECTION: ENERGY AND CHEMICAL REACTIONS

1. A substrate is a substance on which an enzyme acts. Active sites are pockets on an enzyme's surface into which the enzyme's substrate fits.
2. starch
3. its shape
4. a. The substrate is attaching to an enzyme's active site.  
b. The enzyme reduces the activation energy of the reaction, and the reaction occurs.  
c. Products form and are released, signaling that the reaction is complete.

5. a

## Vocabulary Review

1. c
2. a
3. b
4. g
5. f
6. h
7. d
8. e
9. substrate
10. carbohydrate
11. monosaccharide
12. lipid
13. protein
14. nucleotides
15. nucleic acid
16. Acids are compounds that form hydrogen ions when dissolved in water. Bases are compounds that reduce the concentration of hydrogen ions when dissolved in water.
17. Cohesion is an attraction between substances of the same kind. Adhesion is an attraction between different substances.
18. An enzyme is a substance that speeds up chemical reactions. An active site is the location on an enzyme that binds to a substrate.
19. Energy is the ability to move or change matter. Activation energy is the energy needed to start a chemical reaction.
20. DNA is a nucleic acid that stores hereditary information used to make proteins. RNA is a nucleic acid that is involved in protein synthesis.
21. ATP is an organic molecule that acts as the main energy currency of cells. Carbohydrates are organic molecules that act as a source of energy in cells.

## Science Skills

### ANALYZING INFORMATION/ INTERPRETING GRAPHS

1. The polar ends of the soap molecules are attracted to the water and pull the soap into the water. The nonpolar ends of soap molecules are attracted to the oil. The oil then mixes with the